Project Report: Recognition of Theoretical Environments on Mars

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Project Progress

This is the first year of our effort in the Marine Biological Laboratory (MBL) NAI. Our accomplishments have largely been in developing foundations for future research efforts from our ongoing research on the effects of changes in the climate of Mars on surface deposits and implications for the presence and state of water on the surface. Our preparatory work has included developing spectral libraries and databases necessary for the interpretation of remotely−sensed data of Mars and the Rio Tinto site, and developing linkages necessary to complete the first phase of research which we plan to begin more fully in the second year of the investigation. We have identified a graduate student to begin work on this project beginning in the fall of 2004, and have also helped Aline Gendrin attain a NRC post doctoral to work on the project. She will begin in the fall of 2004 as well. One primary objective of our research is to methodologies and understanding from the Rio Tinto site that could be used as exploration tools for Mars. Over the last 6 months we have been working with the data from Mars Express instruments HRSC (High Resolution Stereo Camera) and OMEGA. Both have returned spectacular data that will be integrated into the analyses planned for data collected during the field and laboratory phases of the Rio Tinto work beginning this fall.

Highlights

- A foundation has been established to fulfill the primary research objectives of our project through the development of spectral library databases and calibration of HRSC and OMEGA data for analysis in the context of the Rio Tinto results.
- Using data from the recent Mars missions (MGS and Odyssey), we showed multiple lines of evidence for surface deposits formed as a result of quasi−periodic climate change on Mars. The observations span a large number of scales (meters−kilometers−100s of kilometers), are of diverse nature (morphology, topography, and chemistry), and are remarkably consistent with models of current and past ground−ice stability. These results all point to the presence of a meters−thick, latitude−dependent surface deposit that is young, ice−rich when formed, and whose deposition is driven by orbitally induced climate

change.

Roadmap Objectives

- ***Objective No. 2.1:*** Mars exploration
- ***Objective No. 7.1:*** Biosignatures to be sought in Solar System materials

Mission Involvement

Mission Class*	***Mission Name (for class 1 or 2) OR Concept (for class 3)***	***Type of Involvement*** **
1	Mars Reconnaissance Orbiter	Co−Investigator
1	Mars Express	Co−Investigator
2	Mars Science Laboratory	Other
3	Astrobiology Field Laboratory	Planning Support

* Mission Class: Select 1 of 3 Mission Class types below to classify your project:
1. Now flying OR Funded & in development (e.g., Mars Odyssey, MER 2003, Kepler)
2. Named mission under study / in development, but not yet funded (e.g., TPF, Mars Lander 2009)
3. Long−lead future mission / societal issues (e.g., far−future Mars or Europa, biomarkers, life definition)

** Type of Involvement = Role / Relationship with Mission
Specify one (or more) of the following: PI, Co−I, Science Team member, planning support, data analysis, background research, instrument/payload development, research or analysis techniques, other (specify).

We are developing strategies to relate the observations of Rio Tinto and its unique environment to remotely sensed signatures of relevance to existing (Mars Express OMEGA/HRSC) and future (Mars Reconnaissance Orbiter CRISM; MSL) Mars missions.